REMARKS

Applicants thank the Examiner for his time and the Interview on December 18, 2001.

Claims 1-42 are pending in the present application. The Examiner has withdrawn claims 3, 5, 17, 19 and 25-40 from consideration. Claims 8 and 9 have been cancelled. New claims 41 and 42 have been added to the present application. Claims 1-2, 4, 6, 15-16, 18 and 20-24 have been amended herein. No new matter has been added by way of these amendments and new claims because each amendment and new claim is supported by the present specification. For example, claim 1 has been amended to more clearly recite the hybridization conditions and reads on a DNA fragment. Support for the hybridization conditions can be found in the present specification, for example, in Example 6 (pages 46-47). Claims 2, 4 and 16 have been amended to clearly recite that the plant in claim 1 or 15 is a dicot or monocot. Claims 15, 16, 18, and 20-23 are presently drawn to an isolated DNA fragment. Claim 15 has been amended to more clearly recite the hybridization conditions. Support for hybridization conditions can be found in the present specification, for example, in Example 6 (pages 46-47). Claims 1-2, 15-16, 18 and 20-24 have further been amended to correct a clerical error. Applicants have corrected the clerical error in claims 1, 5, 15, 18 and 20-24 so that it is clear that the protein has the protoporphyrinogen oxidase activity.

Further, it is noted that many of the amendments made herein are not made for patentability purposes (*e.g.*, to avoid the prior art) which might otherwise raise estoppel issues under the recent holding of *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 56 USPQ2d 1865 (Fed. Cir. 2000). For example, the amendments made herein with regard to claims 1, 2, 4, 15, 16, 18 and 20-24, while responding to an outstanding rejection under 35 U.S.C. § 112, second paragraph, simply serve to clarify the inventive discovery that the Applicants regard as their own, without narrowing the scope of the same claims.

Newly added claims 41 and 42 read on the selected nucleotide sequence, as required by the Election/Restriction requirement (see Office Action dated August 14, 2001, pages 2-3). Support for claim 41 can be found in the present specification, for example, at pages 4, 46 and 47. Support for claim 42 can be found in the specification at pages 5, 46 and 47.

Thus, no new matter has been added by way of the above amendments and new claims.

Based upon the above considerations, entry of the present amendment is respectfully requested.

In view of the following remarks, Applicants respectfully request that the Examiner withdraw all rejections and allow the currently pending claims.

Information Disclosure Statement

In the outstanding Office Action, the Examiner requested that copies of the references cited in the Information Disclosure Statement (IDS) filed on August 18, 1999 be submitted. Upon review of the file, we find that no IDS was filed on this date. Applicants believe that the Examiner is referring to the IDS filed with the application on June 23, 1999, which listed, but did not include, copies of the references cited in the International Search Report. Accordingly, copies of the cited references are being filed concurrently herewith.

Claim Objection

The Examiner has objected to claim 8 because of a typographical error. Applicants have cancelled claim 8. Thus, the objection is now moot, and Applicants respectfully request the Examiner to withdraw this objection.

Issues under 35 U.S.C. § 101

The Examiner has rejected claims 15, 16, 18 and 20-23 under 35 U.S.C. § 101 as allegedly being directed to a non-statutory matter. Each of said claims 15, 16, 18 and 20-23 as presently amended is directed to an isolated DNA, which is patentable subject matter. Thus, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

Obviousness-type Double Patenting

In the Office Action, the Examiner has rejected claims 20-24 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-6 of U.S. Patent 6,160,206.

Claims 1, 2, 4, and 6-11 have been provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 19-22 of co-pending Application No. 09/371,507.

A Terminal Disclaimer will be filed in the near future to overcome these rejections.

Issues under 35 U.S.C. § 112, Second Paragraph

Claims 1, 2, 4, 7-16, 18, and 20-24 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Applicants respectfully traverse.

1. *The term "biologically functional equivalent"*

Claims 1, 2, 4, 7-14 and 15-24 have been amended to remove the phrase "biologically functional equivalent" therefrom. Thus, the claims have been amended herein to clarify that the full protein has PPO activity in a plant or plant cell. Applicants respectfully submit that the amended claims more particularly point out the claimed subject

matter. Thus, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

2. *Markush terminology*

The Examiner has rejected claims 1, 2, 4 and 7-14 because claim 1 has improper Markush terminology. Applicants have amended claim 1 to correct the typographical error, such that the Markush group has been joined by the word "and". *See* M.P.E.P. § 2173.05(h). Thus, Applicants respectfully request the Examiner to withdraw this rejection.

3. *The terms "homologous" and "can be detected and isolated"*

The Examiner has also rejected claims 1, 2, 4, 7-16, 18, 21 and 24 under 35 U.S.C. § 112, second paragraph, because of the recitations of "homologous" and "can be detected or isolated by DNA-DNA or DNA-RNA hybridization methods".

Applicants have amended the appropriate claims to more clearly point out the hybridization conditions without referring to homology. Thus, claims 1, 2, 4, 7-16, 18, 21 and 24 do not recite the DNA fragment as "homologous" to a nucleic acid. Thus, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

Issues Under 35 U.S.C. § 112, First Paragraph

1. Written Description

Claims 1, 2, 4, 6-18 and 20-24 have been rejected under 35 U.S.C. § 112, first paragraph, as allegedly having insufficient written description in the specification (see Office Action dated August 14, 2001, pages 8-11). Applicants respectfully traverse and request the Examiner to reconsider and withdraw this rejection.

Applicants first note that they have amended these claims appropriately so that "biologically functionally equivalent" is not being claimed, and that the DNA fragment now encodes "a part of the protein, wherein said protein has protoporphyrinogen oxidase activity in plants" (for example, see claim 1).

Applicants also submit that the specification sufficiently describes the DNA fragment presently recited in the claims. For example, the teachings in the specification with regard to the Xho/PmaC2.6 fragment are evidence that the specification sufficiently describes the DNA fragment as presently recited in the claims. In Example 7 (starting at page 47), the specification clearly describes the Xho/PmaC2.6 fragment to have a nucleotide sequence encompassed within the PPO gene. And because the PPO gene certainly encodes a protein having protoporphyrinogen oxidase activity, it naturally follows that the Xho/PmaC2.6 fragment is a species of the DNA fragment encoding a part

of a protein, wherein the protein has a protoporphyrinogen oxidase activity.

The specification then recites data as evidence that the Xho/PmaC2.6 fragment indeed confers, upon plants or plant cells, a resistance to protoporphyrinogen oxidase-inhibiting herbicides when introduced and expressed in the plants or the plant cells. The specification also teaches that Xho/PmaC2.6 encodes said part in which an amino acid corresponding to Val13 of SEQ ID NO:1, SEQ ID NO:2 or SEQ ID NO:3 is substituted by another amino acid.

Applicants submit that the specification sufficiently describes the multitude of DNA fragments. As the specification describes techniques for testing protoporphyrinogen oxidase activity, one of ordinary skill in the art can certainly test for the protoporphyrinogen oxidase activity. After producing the DNA fragments, one of ordinary skill in the art can apply such tests for protoporphyrinogen oxidase activity as utilized with Cos2955.

Additionally, Applicants respectfully submit that one of ordinary skill in the art can indeed determine the multitude of DNA fragments encoded by a hybridizing sequence, which corresponds to Val13 of SEQ ID NO:1. It is clear from the above amendments that the hybridizing sequence hybridizes to the DNA fragments themselves and not to any DNA homologous to said DNA fragments. The hybridization conditions recited in the claims are stringent to sufficiently encompass sequences of the

DNA fragments that one of ordinary skill in the art can recognize which amino acid encoded thereby corresponds to Val13 in SEQ ID NO:1. Additionally, in order to determine the amino acid corresponding to Val13, the specification teaches that the gene analysis software GENETYX (SDC Software Development) can be utilized to determine which amino acid corresponds to Val13 of SEQ ID NO:1 (see present specification, Example 10, page 54). As utilized with Xho/Pma2.6, one of ordinary skill in the art can apply the gene analysis software to the hybridizing DNA fragments in order to determine which amino acid corresponds to Val13.

Thus, Applicants submit that the specification sufficiently describes the DNA fragment presently recited in the claims. Therefore, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

2. *Enablement*

The Examiner has also rejected claims 1, 2, 4, 6-16 and 20-24 under 35 U.S.C. § 112, first paragraph, as allegedly failing to enable one of ordinary skill in the art to make and use the invention. Specifically, the Examiner states that the specification does not teach a person skilled in the art to make and use the invention that is commensurate in scope with the claims, nor does the specification "reasonably provide enablement for any DNA fragment of encoding a part of the protein having

PPO activity in plants" (see Office Action, page 12). Reconsideration and withdrawal of this rejection are respectfully requested.

First, Applicants note they have amended the appropriate claims.

Second, Applicants respectfully submit that the specification provides sufficient enablement to make and use the multitude of DNA fragments. The specification clearly teaches in Example 7 (see pages 47-51) that the DNA fragments can be produced by conducting a restriction digestion with DNA fragments that encodes the amino acid sequence having protoporphyrinogen oxidase activity. The rejection above sets forth no considerations of why the restriction digest is insufficient to fulfill the requirement for "making" the DNA fragments. The above rejection likewise sets forth no consideration as to why the specification is insufficient to fulfill the requirements for "using" the DNA fragment. Still, Example 5 of the specification clearly teaches a particle gun method so that one of ordinary skill in the art can employ the particle gun methods to confer herbicidal resistance to *Chlamydomonas*. Clearly, this is at least one use of the DNA fragments, which one of ordinary skill in the art can perform without undue experimentation.

Also, the specification provides sufficient enablement to make and use the claimed methods. The specification clearly enables one of ordinary skill in the art in introducing DNA fragments into plant cells. As described, the particle gun method would sufficiently enable one of

ordinary skill in the art to introduce the DNA fragments into plants and plant cells for expression. Thus, the specification clearly enables the present invention.

Therefore, for the above reasons, the Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

Issues Under 35 U.S.C. § 102(b)

The Examiner has rejected claims 1, 2, 10, 11, 12-16 and 24 under 35 U.S.C. § 102(b) as allegedly being anticipated by Ward et al. (WO 95/34659; hereinafter "Ward"). The Examiner states that Ward teaches PPO herbicide resistant mutant genes that differ from the wild-type by single base changes, where these mutants genes can be considered biological functional equivalents of DNA fragments encoding PPO proteins in which an amino acid corresponding to valine is changed to another amino acid and confers the resistance (see Office Action, page 14). Applicants respectfully traverse.

Applicants respectfully submit that Ward does not anticipate all features of the present claims. Specifically, Ward fails to describe a protein or a part of a protein in which the amino acid corresponding to Val13 of SEQ ID NO:1 is substituted by another amino acid. In contrast, the present claims are drawn to a DNA fragment and not to all biological material conferring a resistance to protoporphyrinogen oxidase-inhibiting herbicides upon plants or plant cells or algal cells.

Applicants note that claims 1, 2, 4, 10-16 and 24 no longer claim a "biologically functional equivalent thereof". Thus, Ward fails to anticipate the DNA fragment as presently claimed in claims 1, 2, 4, 10-16 and 24. Therefore, Applicants respectfully request the Examiner to withdraw this rejection.

Issues Under 35 U.S.C. § 103(a)

The Examiner has rejected claims 1, 2, 4, 10-16, 18 and 20-24 under 35 U.S.C. § 103(a) as being unpatentable over Ward in combination with Purton *et al.* (*Plant Molecular Biology*, Vol. 24, pp. 533-537 (1994); hereinafter Purton). Reconsideration and withdrawal of this rejection are respectfully requested.

The combination of the Purton and Ward references fails to suggest utilizing the DNA fragment encoding the protein or the part of the protein in which the amino acid corresponding to Val13 is substituted. As noted above, the genes of Ward (see Example 24) are substantially different from said DNA fragment. The genes described in Example 24 provide insufficient basis to suggest utilizing the DNA fragment, as this Example fails to suggest converting in the genes thereof the codon which encodes the amino acid corresponding to Val13. One of ordinary skill in the art can certainly appreciate that the genes of Example 24 of Ward are an insufficient basis to suggest that all forms of DNA which can factor in conferring resistance to protoporphyrinogen oxidase-

inhibiting herbicides upon plants or plant cells. It follows that the genes of Ward fail to suggest the DNA fragment, or a method comprising the utilization of said DNA fragment.

Further, Purton fails to suggest that the method thereof can have the DNA fragment utilized therein. Purton teaches that the method thereof utilizes the gene (*ARG7*) encoding argininosuccinate lysase (ASL), which is also very different from the DNA fragment encoding the protein or the part of the protein in which the amino acid corresponding to Val13 is substituted. From such teachings of Purton with *ARG7*, one of ordinary skill in the art would of course find no motivation to utilize the DNA fragment.

Thus, based on the above reasons, the present invention encompasses patentable subject matter over the combination of Ward and Purton.

Applicants have taken substantial steps to advance prosecution of the present application. Since a clerical error involving the protoporphyrinogen oxidase activity has contributed to an incorrect construction of the subject matter encompassed in the claims, Applicants respectfully request that the Examiner reconsider each of the above rejections based on the subject matter encompassed by the present claims. While the Examiner may reconsider each of the above rejections, Applicants maintain that each of the pending claims have patentable subject matter. Thus, Applicants request the Examiner to issue a Notice

of Allowance indicating the patentability of the present invention and present claims.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Eugene T. Perez (Reg. No. 48,501) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

Attached hereto is a marked-up version of the changes made to the application by this Amendment.

Pursuant to 37 C.F.R. § 1.17 and 1.136(a), Applicants respectfully petition a two (2) month extension of time for filing a response in connection with the present application. The required fee of $400.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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Attachment: Version with Markings to Show Changes Made

(Rev. 09/26/01)

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 8 and 9 have been cancelled.

The claims have been amended as follows:

1. (Amended) A method of conferring resistance to protoporphyrinogen oxidase-inhibiting herbicides upon plants or plant cells, comprising introducing a DNA fragment[, or a biologically functional equivalent thereof,] or a plasmid containing the DNA fragment [or its biological functional equivalent] into plants or plant cells or algal cells, wherein said DNA fragment [or said biologically functional equivalent] is expressed and has the following characteristics:

(1) said DNA fragment encodes [a protein or] a part of the protein [having], wherein said protein has protoporphyrinogen oxidase activity in plants;

[(2) said DNA fragment is homologous to a nucleic acid encoding an amino acid sequence selected from the group consisting of SEQ. ID. NO.:1, SEQ. ID. NO.:2 or SEQ. ID. NO.:3; encodes a protein or a part of a protein in which an amino acid corresponding to Val13 of SEQ. ID. No.:1 or SEQ. ID. No.:2 or SEQ. ID. No.:3 is substituted by another amino acid; that can be detected and isolated by DNA-DNA or DNA-RNA hybridization methods; and]

(2) said DNA fragment has a sequence that can be detected and isolated by DNA-DNA or DNA-RNA hybridization to a nucleic acid sequence

encoding an amino acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:2 and SEQ ID NO:3, wherein said DNA-DNA or DNA-RNA hybridization occurs under 2X PIPES buffer, 50% deionized formamide, 0.5% (w/v) SDS, 500µg/ml denatured sonicated salmon sperm DNA at 42°C overnight; and said DNA fragment remains hybridized after washing in 2X SSC, 1% (w/v) SDS;

(3) said DNA fragment encodes the part of the protein in which an amino acid corresponding to Val13 of SEQ ID NO:1, or SEQ ID NO:2 or SEQ ID NO:3 is substituted by another amino acid; and

[(3)] (4) said DNA fragment has an ability to confer resistance to protoporphyrinogen oxidase-inhibiting herbicides in plant or algal cells when expressed therein.

2. (Amended) The method according to claim 1, wherein the [DNA fragment or biologically functional equivalent thereof, or a plasmid containing the DNA fragment encodes a protein or a part of the protein having protoporphyrinogen oxidase activity in] plant is a dicot.

4. (Amended) The method according to claim 1, wherein the [DNA fragment encodes a protein or a part of the protein, having protoporphyrinogen oxidase activity in] plant is a monocot.

6. (Amended) The method according to claim 1, wherein the DNA fragment encodes a protein or a part of the protein, wherein said protein has [having] protoporphyrinogen oxidase activity in *Chlamydomonas*, and the DNA fragment encodes [a protein in which Val13 of [SEQ. ID. NO.:1] SEQ ID NO:1 is replaced by another amino acid] the protein or the part of the protein in which an amino acid corresponding to Val13 of SEQ ID NO:1 is substituted by another amino acid.

15. (Amended) [A] An isolated DNA fragment [or its biologically functional equivalent thereof] which has the following characteristics:

(1) said DNA fragment encodes [a protein or] a part of the protein [having], wherein said protein has protoporphyrinogen oxidase activity in plants;

(2) said DNA fragment has a sequence that can be detected and isolated by DNA-DNA or DNA-RNA hybridization to [a nucleic acid sequence homologous to] a nucleic acid sequence encoding an amino acid sequence selected from the group consisting of [SEQ. ID. NO.:1, SEQ. ID. NO.:2 and SEQ. ID. NO.:3] SEQ ID NO:1, SEQ ID NO:2 and SEQ ID NO:3, wherein said DNA-DNA or DNA-RNA hybridization occurs under 2X PIPES buffer, 50% deionized formamide, 0.5% (w/v) SDS, 500µg/ml denatured sonicated salmon sperm DNA at 42°C overnight; and said DNA fragment or its complement remains hybridized after washing in 2X SSC, 1% (w/v) SDS;

(3) said DNA fragment encodes [a protein] the part of said protein in which an amino acid corresponding to Val13 of [SEQ. ID. No.:1 or SEQ. ID. No.:2 or SEQ. ID. No.:3] SEQ ID NO:1 or SEQ ID NO:2 or SEQ ID NO:3 is substituted by another amino acid; and

(4) said DNA fragment has an ability to confer resistance to protoporphyrinogen oxidase-inhibiting herbicides in plant or algal cells when expressed therein.

16. (Amended) The isolated DNA fragment [or biologically functional equivalent thereof] according to claim 15, wherein the [DNA fragment encodes a protein or a part of the protein, having protoporphyrinogen oxidase activity in] plant is a dicot.

18. (Amended) The isolated DNA fragment [or biologically functional equivalent thereof] according to claim 15, wherein the plant is a monocot.

20. (Amended) The isolated DNA fragment [or biologically functional equivalent thereof] according to claim 15, wherein the plant is the green alga *Chlamydomonas* and the DNA fragment encodes an amino acid sequence resulting from replacement of Val13 of [SEQ. ID. NO.: 1] SEQ ID NO:1 by another amino acid.

21. (Amended) The isolated DNA fragment [or biologically functional equivalent thereof] according to any of claims 15 to 20, wherein said another amino acid is methionine.

22. (Amended) The isolated DNA fragment [or biologically functional equivalent thereof] according to claim 20, wherein the DNA fragment has a sequence that can be isolated from genomic DNA of *Chlamydomonas* [and] the DNA fragment encodes a protein or a part of the protein, wherein the protein has [having] protoporphyrinogen oxidase activity, and a nucleotide corresponding to guanine at position 37 (G37) of [SEQ. ID. NO.:4] SEQ ID NO:4 replaced with another nucleotide.

23. (Amended) The isolated DNA fragment [or biologically functional equivalent thereof] according to claim 22, wherein said another nucleotide is adenine.

24. (Twice Amended) A plasmid comprising the DNA fragment [or biologically functional equivalent thereof] described in claim 15.

Claims 41 and 42 have been added.